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Concept of Learning Design for Collaborative Network Activity

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Abstract

The article presents a concept of learning design for collaborative network activity. Construction of the activity focuses on the achievement of the learning and social impact which is revealed as a result of its implementation. The concept takes into account modern socio-cultural trends and factors influencing the educational changes and is based on the conceptual synthesis of system-functioning, ecological-evolutionary and actor-network approaches. Development of the concept as a theoretical knowledge allowed to reveal its content within the framework of the theory structure logics: reason, core, consequence, outcome. Collaborative network activity models have been developed the implementation of which allowed to outline relevant for learning features of collaborative network activity. Investigation of the models helped to formulate the criteria for evaluation of the collaborative network activity dynamics. The article describes examples of the concept based projects, promising directions for the development and implementation.

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1. Introduction

The formation of a new socio-cultural environment has started in XXI century. The most outstanding feature of it is the productive participation of citizens in collaborative production of knowledge and decision making. In every field of human activity the transition from knowledge consuming and reproduction to immediate participation of people in knowledge production and decision making occurs. The appearance of the ICT lead to the origin of new forms of activity, dramatically changed the relations between people, caused the development of new not just

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technological but social competences. The core of such competences lies in the ability to use and acquire the results and skills obtained from the network partners as well as in the ability the share their own achievements and skills with the partners. The transition to the relations of network cooperation assumes the formation of new network units, the participants of which should possess mutual competences in order to solve their tasks. The need in such new competences of productive network cooperation with other people determines the need for changes at all educational levels. Investigation in this direction promotes the definition of the learning significance of the modern tools and methods of work with the ICT. They received the definition both in international and in Russian basic documents related to education.

Necessary solutions in this direction could be drawn from the research in the field of learning design for collaborative network activity. Here the collaborative network activity is assumed as mutual creative activity of educational agents aimed at constructing, changing and implementing digital educational products. Learning design for collaborative network activity will be defined here as educationally grounded and aimed at the achievement of educational result projecting of social technical system including both the new technical tools of cooperative network activity (opening possibility to enrich the activity of educational specialists via implementation of computer programs, digital objects, data, connections) and the new organizational forms and scenarios for collaborative network activity.

2. Objectives, methodology and research design

The research objective is the development and practical implementation of learning design concept as a social projecting for collaborative network activity within the system “agents of learning process – collaborative tools – products of collaborative activity”.

In order to achieve the objective the following tasks are outlined:

- To analyze the modern socio-cultural situation and to define the leading trend and factors influencing changes in education;
- To give grounds for investigation methodology, the define structure and to develop the concept content of learning design for collaborative network activity between educational agents.

In the course of research (2006-2015) the construction, observation and analysis of the development dynamics in Russian and international educational communities related to the structuring of common hypertexts, digital histories, informational ontologies, scenarios for educational activity, regulating acts, multi-agent models for collaborative activity, elements and possible scenarios for educational development are conducted. The invariant elements which comprise the common conceptual scheme for collaborative activity are outlined. The metrics are worked out which are used for prediction of educational networks development. The competences for collaborative network activity are defined and described which are formed inside the educational communities of various types. The concept of learning design for systems of collaborative network activity is worked out and experimentally tested. Learning and social impact revealed in the course of testing and its results are analyzed and interpreted.

3. Discussion of the research outcomes

The problem of the learning design development for collaborative network activity as one of the means contributing to the integration of today learners into a new social environment represents one of the most important tasks for the learning science and educational practice. In order to integrate the agents of education into a new social environment successfully it is important to know the features and peculiarities of the environment.

Resulting from the data analysis of various spheres (science, legislation, economics, public activity, education etc.) the importance of collaborative productive activity determining the dynamics of the modern society development emerges. The analysis of the previous research results in the sphere of computerization and society development allows to define the new strengthening social trend for integration of people via computer devices into network units for knowledge production (Engeström et al., 2010; Fischer, 2008). The rapid and stable growth of numbers of the collaborative network projects, involvement of more and more new fields of industrial and social life into it allow to conclude that socialization of the ICT sphere and the transfer of collaborative activity practices into

this sphere represent a stable trend in the modern society development which should be included into the research field of educational science.

The importance and long term character of the mentioned trend is acknowledged by the educational community. The fact is supported by the analysis of the strategic documents defining the development of education as well as by the expert assessment results. The analysis of the international expert opinions allows to conclude that many countries in XXI century attribute special attention to the competences related to various types of collaborative activity, to the ability to act as a citizen both at the local and at the global level, to the ability of participation in productive activity and to contribute to the activities of various units (UNESCO, 2011). Conducted within the given research investigation of the teachers' (including pedagogical institutions staff ; over 300 educationalists took part in poll) opinions concerning most perspective educational Internet practices proves the importance of collaborative network activity which Russian teachers attribute to the topic. The results of the network project on constructing the generalized image of a Russian school graduate 2020 (over 500 participants) allow to state that teachers place the graduate skills connected with the use of ICT for collaborative productive activity among the key competences necessary for successful activity in modern environment. The obtained results proved the influence of the defined trend on the sphere of education and the necessity of consideration of the collaborative network activity among learning agents by educationalists.

On the basis of actor-network approach to modern socio-cultural situation the meaning of the following socio-cultural factors actively influencing the educational process is established: computerization, existence of digital infrastructure, digital enrichment of activity, social enrichment of activity, global monitoring of activity, interrelations of agents and objects. The selection of actor-network approach and the consideration of the modern socio-cultural situation as a network of relations between actors of various types allowed to attribute a certain type of items to each of acting factors and thus to avoid their possible repetition and multiplication.

Computer devices and programs help the learning agents to think and act together but create new risks related to the problems of technological dependence and complexity of communications in hybrid communities. Mass creation of digital objects widens the possibilities for repeated and collaborative use. At the same time the accessibility of digital content for copying and acquisition creates risks of unrestrained consumption of information lowering the quality of learning content.

People and their mental abilities widen the possibility of collaborate activity and productive exchange. On the other hand, permanent involvement in communication with other people gives birth to new risks of endless communication, diffusion and loss of identity. The growth of the links number, their accessibility for observation, understanding and educational interpretation widens the possibility for the comprehension of the network phenomena importance in education. At the same time the overall mutual linkage creates risks of endless transitions over references and links, increase of ambiguity and instability. The network integration of people and devices gives birth to the growth of digital records which could be used for the disclosure of previously unknown, original, practically useful and accessible for interpreting knowledge, necessary to people for decision making. However the avalanche-type growth of digital data creates risks of total control and informational noise.

In the given research the concept is perceived as a certain way to comprehend the reality which outlines the content frame according to which educational phenomena and processes are considered and organized. The idea is proved that the systems of collaborative network activity of learning agents represent complex developing systems for studying and design of which the transfer of theoretical methodological concepts developed not only in educational science but also in the relevant for the design fields is needed. In this connection the given research fulfilled the conceptual synthesis of system-functioning, ecological-evolutionary and actor-network approaches.

The system-functioning approach allows to consider the projected system for collaborative network activity as the activity system in which such elements as activity agents, activity objects, activity tools, activity regulations, community and division of labor are interrelated. As basic statements possessing the biggest explanatory potential the research defines the following:

- Statement on the productivity of activity;
- Statement on subjectivity as an indicator characterizing the involvement of a learner into activity as well as a measure of control and self-determination.

The ecological-evolutionary approach allows to consider the projected system as a digital ecosystem, in which such notions as environment, organism, population, community, evolution are interrelated. Considering the system of collaborative network activity as evolutionary developing ecological system opens additional possibilities for the educational science. The use of a digital ecosystem metaphor allows to consider the situation of the network activity as a permanent evolution which is related to the tools, ways of activity and behavior of the learning agents.

The following most important statements possessing high explanatory potential are defined in the research:

- Statement on possibilities, opened by the environment for the enrichment of collaborative network activity;
- Statement on development and evolution as a necessary characteristic of evolution.

The actor-network allows to consider the projected system of collaborative network activity as a network in which such notions as actors and links are interrelated.

As the basic statements of the actor-network approach possessing the explanatory potential the given research defines the following:

- Statement on connectivity as an indicator which characterizes the value of the network structure;
- Statement on a central position as an indicator characterizing the degree of impact and control inside the network.

The synthesis of the basic concepts allowed to construct a system in which the concepts of the chosen approaches are consistently combined. In the frame of this system learning is considered as a gradual establishment by an agent of collaborative activity links with other network actors and his/her transition from the periphery to the center of the collaborative activity.

4. Structure and content of concept of learning design for collaborative network activity

The core of the concept is a synthesis of sphere ideas, the first of which relates to productive activity of separate learning agents; the second – to the development (evolution) of interrelations in the system of collaborative network activity and the third – to the further complication of the network activity structure. Here the links and relations are established between the basic elements comprising the concept of the collaborative network activity of learning agents. The basic notions are of an invariant character and can be used for the description, analysis and construction of the system of collaborative network activity of the learning agents irrespective of the type of learning products to produce which the community constructs its activity.

The leading idea of the concept is the following: the collaborative network activity and the network cooperation of the learning agents are aimed at the creation of various types of learning products which in general could be marked by a widely recognized term “digital story”.

The basic scheme of the concept is the following: the digital story and the constituent elements of it could be used by other participants of the collaborative activity in creation of new stories.

The role of narration and the meaning of the practice of narration for various fields of activity were stressed by J.S. Bruner (Bruner, 2003). When the computer technologies started to be used the variety of forms for creation of digital stories emerged (digital storytelling). Modern research (Gee, 2007; Grobstein, 2005) allowed to widen our understanding of the variety of the modern digital story modifications. In the frame of the given research the term “digital story” comprises the variety of forms of narrative texts creation which are worked out within the computer environment (hypertexts, articles in electronic encyclopedias, video-topics, games, simulation models, mental maps etc.).

The learning design within the frame of the given concept structures not only the conditions for a separate learning agent activity within a limited time and space interval but also determines conditions for mid-term interrelation of the learning agents and the exchange of the activity products as well as the conditions for the development and long-term evolution of the whole collaborative activity system based on the selection of the most important stories.

In the focus of the learning design lies not only the learning activity of a separate learning agent related to the creation of an individual product, but also a system of relations between all elements. Thus the subject of the learning design represents not only social projecting of the system “agent-tools-product-outcome” in which digital stories are created, but also projecting of a system in which the interrelation and evolution of these digital stories occur as well as the interrelation and co-evolution of the digital stories authors who are the learning agents. Using the metaphor of chess school we can state that the subject of the learning design is not just the playing board upon

which a single game is being performed but also the whole network of relations which is formed "around the board" between the participants of the collaborative activity. The learning design of the collaborative network activity of learning agents creates the conditions for the development of the narrative texts system functioning in the context of the local cultural tradition, the borders of which could be placed either by the walls of a school or by the form and technical peculiarities of a narrative creation.

The theoretical postulates used for the synthesis of the concept and the leading ideas make it possible to define and substantiate the principles of the collaborative network activity of a learning agent:

- The principle of productivity is important for projecting of a socio-technical system since it underlines the common goal of the collaborative product creation around which the collaborative activity of learning agents is being formed.
- The principle of agency is necessary since it determines the learning outcome of the collaborative network activity – the growth of agency and self-determination of collaborative activity participants related to the acquisition of new activity tools and new development mediators.
- The principle of the activity augmentation is important for the projecting since it determines the possibility to use objects, tool and other people as amplifiers of activity.
- The evolution principle is necessary since it underlines the existence of competition and selection between the created within the socio-technical system products.
- The principle of coherence allows to assess the learning socio-technical system according to the indicators describing collaborative character of the network activity.
- The principle of decentralization is important for the projecting of the collaborative network activity system since it determines the learning outcome as decentralization based on the growth of the subject character of the collaborative activity participants.

The leading idea of the concept and the principles of the learning design determine the following conditions for the realization of the concept of the learning design of the collaborative network activity: condition of openness, condition of safety, condition of network value.

For the successful realization of the collaborative network activity of the learning agents it is necessary to have a clear vision of the possible outcomes, the quality of which could be assessed on the basis of the criteria characterizing the quality of collaborative network activity. To establish the criteria the models of collaborative network activity are developed, the realization of which allowed to reveal educationally meaningful qualities of collaborative network activity of the learning agents. Modeling is considered as a means to obtain information about one system on the basis of experimenting with the other system. The models themselves are considered in the concept as a consequence because they rest upon its basic and core ideas.

In order to achieve the goals of the given research the following models have been developed:

The informational onthological model allowed to present and to systematize all links and relations between the actors of the collaborative network activity system.

The scenario model allowed to classify and to specify the content of roles which the learning agents play in the collaborative network activity systems. The schemes and the language of the scenario development for the learning activity are aimed to fix the relations between the learning materials, learner and teacher.

The cluster model was used for the analysis of the informational space set by several scales. Modeling was used not only to construct the full scale typology of the collaborative network activity situations but also for the selection of parameters for the management of such situations thus widening or limiting the possibilities which are opened by the environment for the individual or collaborative actions of the learning agents.

The network models of the collaborative activity were used for modeling the links between the multitude collaborative network activity participants. While constructing the collaborative activity network model the above mentioned principle of coherence and the condition of network value were taken into account, which presume that the network structure possesses its own value dependent on the quantity and the structure of the links. The consideration of the collaborative network activity as a network structure assumes new criteria and new forms of assessment patterns for the learning activity.

The analysis of the models implementation in the real educational situations and events resulted in the adequate correlation between the assessment of the learning activity outcomes with the criteria and indicators of the

collaborative network activity development, which provides the learning designers and the participants of the collaborative network activity with the aiming orientation and the prognostic potential for the educational perception of the events in the environment of the collaborative network activity.

5. Practical realization of the concept of the learning design for collaborative network activity

The realization of the projects based on the above mentioned statements of the concept represented an important stage of the research.

For example the realization and the outcomes of the learning project "Open school encyclopedia" (2003-2004) in which school children from Nizniy Novgorod, Saransk and Cheboksary (Russian Federation) showed that the acquisition of the informational competences was carried out effectively if the learners' activity is aimed at creation of a mutual product (mutual story) having importance for all the participants. The use of technologies was aimed at strengthening and widening this importance. For the realization of the project according to the developed concept for learning design of collaborative network activity in order to support the environment for the collaborative creation of digital stories the programming aids had been developed which offered the following possibilities to the project participants:

- Automatic linkage of the terms from the text with the articles in which the content of the terms is revealed. On the basis of this aid learning scenarios were developed within the framework of which the learners were offered the tasks to create collaborative stories with the unified list of acting persons and objects;
- Simultaneous linkage of the term name with several articles containing its descriptions typical for different places. Using this aid the scenarios of the collaborative network activity were created in which the learners created collaborative stories representing simultaneously different points of view and several possibilities of reading one and the same hypertext story.

Using the materials of this and other similar projects the dependence between the orientation of the agents on creation collaborative wholesome story and the acquisition of informational competences was shown which are formed in the course of the collaborative network activity.

The mainframe idea of the concept of the learning design for the collaborative network activity lied in the fact that inside the learning socio-technical system the digital story and the elements of this story could be used by other participants of the collaborative activity while creating new stories. Thus the digital story represents the fundamental social educational object around which the activity leading to the formation of social competences is carried out.

The analysis of the existing collaborative activity environment showed that the fullest realization of the concept principles, conditions of openness, storage and network value is possible in such environments as wiki (Patarakin & Visser, 2012).

In 2005-2006 a number of wiki projects were developed. The most well-known of them is the project Letopisi (http://Letopisi.Ru), nation-wide educational project with the international participation which exists nearly 10 years already. At the end of 2014 the project consolidated over 71 000 teachers, students and schoolchildren, who added over 49 000 articles and over 92 000 media-files into the resource.

As the next environment for the organization of the collaborative network activity of the learning agents corresponding to the principles and conditions of the realization of the learning design concept in education serves the environment for creation of digital stories and Scratch models. The experience of using the social Scratch network as an ecosystem, inside of which repeated use and modification of the digital stories occur, shows the direct dependence between the orientation of the participants activity at the development of the ecosystem and the acquisition of social competences, related to the acquisition of experience how to use skills and outcomes of other people activity, and the experience of presentation of personal skills and resources in the form in which they are ready to be used by other people.

The problem of formation of the system competences, the development of ecological mentality, skills to use it in the cognitive, communicative, social practice is the most complex problem, to solve which the learners' design of collaborative network activity is used. The projected system of the collaborative network activity gives extra possibilities not only for the productive activity but also for the analysis and reflection on the processes inside the system. The tools should open the possibility to assess from the network point of view both the position of each participant and the degree of the whole system development as the learning network. The analysis of the activity of

each participant inside the acting community combined by mutual story or mutual game, allows to link the act of activity and the development of one participant with the development of the whole community. In order to investigate the links between the agents and the objects of the network activity within the framework of the given research special tools for visualization of links between the authors and the pages (wikigrams) were developed which represent the relations between actors in the form of a network, the units of which are the pages and the participants creating these pages. The network environment in which the modern collaborative activity is carried out allows to follow the links which occur between the agents and objects of activity. As a rule modern socio-technical systems in which the collaborative activity is carried out, store the story of all activities. Every action of an agent towards an object leads to the formation of a link between them. If the agents perform action over one and the same object they become agents of the collaborative activity, indirectly linked with one another by the mutual object of activity. The collaborative activity network could be presented as the bipartite graph combining agents with objects of collaborative activity. A number of peaks of this graph could be split into two parts so that each edge of the graph links a peak from one part with the other peak from the second part, and there is no edge which would link two peaks from one and the same part. All agents of activity are linked only with the objects and there is no direct links between participants or direct links between objects. If we put together in the same bipartite graph environment objects and agents who created, edited or assessed these objects, we can see groups of people combined by the collaborative social objects. The application for the analysis of the social network used the data of wiki pages to visualize the collaborative network activity (Patarakin & Katkov, 2012).

The use of wikigrams allows to conduct express analysis of the position at the field of the collaborative network activity, to determine the key units of the position – authors and articles, with which the majority of other units are linked, to evaluate the stability of a community according to the number of authors involved into collaborative editing of the collaborative pages.

The following educational and social effects represent the results of the realization of the collaborative network activity learning design concept:

- The development of information competences of learning agents related to the acquisition of skills and experience to use computer devices and programs, to find, to choose, to create and to transform the digital objects in order to get the learning product;
- The development of social competences related to the acquisition of experience to use the skills and outcomes of other people activity and the experience to present personal skills and resources in the form ready to be used by others;
- The development of the system competences related to the acquisition of experience to analyze the network values and the network structures, to the ability and readiness to participate in projects of collaborative network activity;
- The increase of trust and mutual understanding, the growth of social capital, revealed via the formation of new and strengthening of the existing links between agents of the collaborative network activity. Here the objects of the activity are represented by the documents both created and transformed during its expansion and representing certain outcomes personally and socially important for the participants.

6. Conclusion

The developed and tested concept of the learning design for collaborative network activity:

- Takes into account socio-cultural dependence of the educational dynamics and allows to foresee the occurrence of new forms of collaborative activity of the learning agents related to the occurrence of new types of objects and tools for collaborative activity;
- Explains the methodology, principles and conditions of the learning design implementation for projecting the collaborative network activity of the learning agents;
- Offers methods, tools and mechanisms to integrate learners into a new social environment by means of education via their involvement into the collaborative productive activity within the knowledge communities;
- Supports the model of continuous education;

- Strengthens the interrelation of formal, non- formal and informal education by developing objects and tools for network activity which are used by the participants of the network communities belonging to the mentioned educational spheres.

The presented results and arguments allow to conclude that the goal of the research is achieved.

The perspective directions for the development and practical implementation of the learning design concept for the collaborative network activity could be the following:

- Dissemination of the conceptual approach to the organization of socio-educational projects related to the formation and acceptance of the educational policy by society;
- Use of the data of the educational analysis to attract the participants of the learning process to the analysis of personal behavior and collaborative social activity.

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